

File #B

167821 K3

PRELIMINARY Health Assessment for

ALLIED CORP KALAMAZOO PLANT
KALAMAZOO, KALAMAZOO COUNTY, MICHIGAN

CERCLIS NO. MID006007306

DECEMBER 23, 1991

RECEIVED

MAY 28 1993

ERD - SUPERFUND

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (7) (A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risks assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR has conducted this preliminary health assessment on the data in the site summary form. Additional health assessments may be conducted for this site as more information becomes available to ATSDR.

The conclusion and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

PRELIMINARY PUBLIC HEALTH ASSESSMENT

ALLIED CORP KALAMAZOO PLANT

KALAMAZOO, KALAMAZOO COUNTY, MICHIGAN

CERCLIS No. MID006007306

Prepared by

Michigan Department of Public Health (MDPH)

under Cooperative agreement with the

Agency for Toxic Substances and Disease Registry (ATSDR)

THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i)(7)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations, and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR prepared this Preliminary Public Health Assessment using available data and information. ATSDR will reevaluate this site and prepare an updated health assessment as warranted by the availability of additional data and information and as resources permit.

INTRODUCTION

An ATSDR Health Assessment is an evaluation of data and information on the release of hazardous substances into the environment. These assessments are required by the Superfund law for the National Priorities List sites. Objectives of the assessments are:

- 1.) To assess any current or future impacts on public health.
- 2.) To develop health advisories or other health recommendations.
- 3.) To identify actions, including studies, that are needed to either mitigate and evaluate human health effects, or to prevent them from occurring.

A health assessment for a facility or a particular release of substances consists of the evaluation and interpretation of available information and analytical data. The process builds upon existing material and can change as more information and data become available. The assessment process does not wait for completion of all possible studies relevant to a site but instead builds a report based on the best available information from all relevant sources and distributes it in a timely manner.

New information provided by the public following their review of this document will be taken into consideration during preparation of any subsequent updated assessments for the site. Such information can be sent to:

Michigan Department of Public Health
Division of Health Risk Assessment
3423 N. Logan St./Martin Luther King Blvd., P.O. Box 30195
Lansing, Michigan 48909

SUMMARY

The Allied Paper/Portage Creek/Kalamazoo River Superfund site is listed on the United States Environmental Protection Agency (U.S. EPA) National Priorities List (NPL). The site includes the Allied Paper, Inc. Residual Disposal Area, covering 75 acres in Kalamazoo, Michigan; Portage Creek from Cork Street to its confluence with the Kalamazoo River; and 35 miles of the Kalamazoo River, from Portage Creek downstream to Lake Allegan.

Extensive contamination with polychlorinated biphenyls (PCBs) has been found in the water, sediments, and fauna of the river and the creek since sampling started in 1971. The water levels in four impoundments on the river and creek in the site area have been drawn down, exposing contaminated sediments. Isolated instances of ground-water contamination, not all related to activities at the site, have been found at the Allied Paper, Inc. Disposal Area. The ground-water contamination is not expected to result in human exposure through drinking water supplies. A number of remedial actions are being planned or are in process in the site area. The site is a public health hazard due to the threat to health from contact with and incidental ingestion and inhalation of contaminated soils and ingestion of contaminated biota. In addition, abandoned structures, irregular terrain, and unstable land on the Allied Paper, Inc. Residual Disposal Area site present physical hazards to members of the public who might use the area. The Allied Paper, Inc. Residual Disposal Area has been fenced.

BACKGROUND

The Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site is on the United States Environmental Protection Agency (U.S. EPA) National Priorities List (NPL).

A. Site Description and History

The Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site (API/PC/KR) extends from Cork Street above Bryant Mill Pond on Portage Creek in Kalamazoo, Michigan, down Portage Creek to its confluence with the Kalamazoo River, and on the Kalamazoo River from this confluence downstream to the Allegan City Dam (Figure 1). Laterally, the site includes, but is not limited to, Allied Paper, Inc., property south of Alcott Street and all other facilities currently or previously owned, operated or leased by Allied Paper, Inc./HM Holdings, Inc., Georgia-Pacific Corporation, or Simpson Plainwell Paper Company that are contiguous to Portage Creek or the Kalamazoo River within the limits stated above. The site also includes any other areas within the upstream and downstream boundaries which are contiguous to the NPL site where soil, sediment, surface water, or ground-water contamination exists or is discovered during the course of the Remedial Investigation/Feasibility Study or design and construction phases. Included within the boundaries of the site are the former Allied Paper, Inc. mill (last operated by Performance Paper), landfills, lagoons, and sludge disposal areas, and the Simpson Plainwell Paper Company mill, lagoons, and sludge disposal areas. The site includes a total of approximately 3 miles of Portage Creek and 35 miles of the Kalamazoo River, from the city of Kalamazoo to the Allegan City Dam.

The Allied Paper, Inc. Residual Disposal Area (the Allied Paper site) is located in the south portion of the City of Kalamazoo, Michigan. It covers approximately 75 acres, bounded by Alcott Street to the north, the Conrail tracks to the west, Cork Street to the south, and the high water mark on the east bank of Portage Creek to the east. Portage Creek flows to the north along the east side of the Allied Paper site. A dam at Alcott Street formerly created an impoundment in the creek known as the Bryant Mill Ponds. The upper and lower ponds were separated by a currently abandoned causeway. The sluice gate in the dam has been open since 1976, and the ponds have drained. The dewatered pond beds are part of the site. A detail map of the Allied Paper site is included as Figure 2.

The Allied Paper, Inc. Residual Disposal Area has been used by two nearby Allied Paper, Inc. paper plants, whose approximate locations are shown on Figure 3. The Monarch Mill, once located south of Cork Street on the east side of Portage Creek, was demolished in 1980 and the site of the mill has been redeveloped. The Performance Paper plant, formerly Allied Paper's Bryant Mill, is located on the east bank of Portage Creek on the north side of Alcott Street. Discharges have been reduced drastically due to changes in paper processing methods and to declining operations at the plant. Performance Paper, Inc., is in bankruptcy and has closed their plant.

Slurried wastes from paper recycling processes were pumped from the present Performance Paper plant to a clarifier at the highest point of the Allied

Paper site. After settling out, the solids were transferred to a pair of lagoons for further dewatering. The liquids were pumped off into a series of ponds, partitioned by dikes, and then traveled to the City of Kalamazoo wastewater treatment system, while the dewatered solids were placed into a landfill on the site. Depending on the quantity of waste and changing regulations, the liquids have also been discharged into Portage Creek or recycled through the plant's processes.

Certain specialty inks, especially those used in carbonless reproduction paper, formerly contained polychlorinated biphenyls (PCBs). In the de-inking phase of the process of recycling paper fibers, the PCBs were liberated and adsorbed to the waste fibers. Though PCBs have a very low solubility in water, some flowed into the creek with the liquid from the settling ponds (probably adsorbed to suspended particles). Changes in paper processing methods and ink formulations eliminated the use of PCBs in the mid-1970s.

A clarifier used by the Monarch Mill operations remains on the south end of the Allied Paper site, between Portage Creek and Cork Street. Its liquid effluent was discharged either to the creek or to the City of Kalamazoo wastewater treatment system. There is a former settling lagoon east of the clarifier, between Portage Creek and Cork Street.

The currently active landfill covers 7.8 acres of the site (Figure 2). Renewal of the company's license to operate the landfill was denied by the MDNR in May 1987 because of the detection of PCBs in the ground water at the landfill and other alleged violations of the terms of the operating license. A Partial Consent Order issued by the Federal District Court allows the landfill to remain in operation until it is full. There are borrow pits for the landfill operation along the west side of the Allied Paper site. Cattails and other emergent plants have become established in the settling ponds.

The 12th Street Sludge Disposal Area is an 8-acre site on the south bank of the Kalamazoo River approximately 1.5 mile northwest of Plainwell, Michigan. From 1955 to 1983, operators of a paper mill in Plainwell, owned since late 1987 by the Simpson Plainwell Paper Company, used this site to dispose of waste residuals from their operations. From 1910 to 1962, operations at the mill included de-inking and recycling paper, and, from 1957 to 1962, the input presumably included carbonless copy paper with ink that contained PCBs. In 1987, the MDNR identified PCBs in the waste at the 12th Street Sludge Disposal Area, and in 1990, the U.S. EPA included the area in the API/PC/KR site.

Twenty-two acres, once owned by Allied Paper or one of its predecessor companies, south of Alcott Street and west of Portage Creek was purchased in 1965 by Reliance Universal, later named or called Reliance Panelyte, who operated until the mid-1970s. This area is not part of the API/PC/KR site. Buildings from the operation remain on a portion of the Panelyte area, but they are partially dismantled (Figure 2). There is reportedly some dispute concerning the current title to the property. The City of Kalamazoo administration, declaring the buildings an attractive nuisance, had the first floor walls of the buildings removed in 1986.

During the 1986 partial dismantling of the Panelyte buildings, PCB oil leaked from a transformer into the building. Inappropriate procedures were allegedly used during an attempt to clean up this spill. In November 1990, the U.S. EPA completed a clean-up of the PCB contamination and other hazards in the building, including asbestos insulation.

Stryker Surgical Supplies owns and operates a facility on land once owned by one of Allied Paper's predecessor companies on the east side of Portage Creek, on the south side of Alcott Street (Figure 3). Their lot line extends to the middle of the creek.

The Kalamazoo River has been dammed in five places within API/PC/KR. In a direction traveling downstream from Kalamazoo, these were the Plainwell, Otsego City, Otsego, Trowbridge, and Allegan City Dams. The Allegan Dam, 10 miles downstream from the terminus of API/PC/KR, forms Lake Allegan. The Plainwell, Otsego, and Trowbridge dams and their impoundment areas were acquired by the State of Michigan in the late 1960s, and are administered by the MDNR. The impoundments were drained in the early 1970s because of potential dam failure. The superstructures of the dams were removed in 1988 to reduce the State's liability. These actions also had the effect of reducing contact between the river water and the PCB-contaminated sediments. The exposed bottomlands remain State property and are included in API/PC/KR.

PCBs were first identified in the water, sediments, and fish of the Kalamazoo River and Portage Creek in 1971. Since then, a number of studies have been carried out in the area under the supervision of the MDNR and other State and Federal agencies. In 1984, the MDNR listed the Portage Creek/Kalamazoo River site, from Kalamazoo to Saugatuck, on the Priority List for Evaluation and Interim Response under Act 307.

The Michigan Department of Public Health (MDPH) first issued an advisory concerning consumption of fish from the Kalamazoo River and Portage Creek in 1977, due to elevated PCB levels. The current advisory in the vicinity of API/PC/KR advises against any consumption of carp, catfish, suckers and largemouth and smallmouth bass taken from Portage Creek from Monarch Mill Pond (south of Cork Street) downstream through the Allied Paper site to the Kalamazoo River, or from the Kalamazoo River from Morrow Pond Dam (upstream of Kalamazoo) to Allegan Dam. It is recommended that consumption of all other species taken from these waters be restricted to no more than one meal per week. Nursing mothers, pregnant women, women intending to have children, and children age 15 and younger should not eat any fish from these waters. Concerning fish taken from the Kalamazoo River downstream from Allegan Dam, the MDPH advises against consumption of carp, catfish, and northern pike longer than 25 inches, and that no more than one meal a week should be eaten of smaller pike, largemouth bass longer than 15 inches, and smallmouth bass. The sensitive populations mentioned above are advised not to eat any of the fish listed.

Remediation activities associated with the contaminated sediments in the former impoundments on the Kalamazoo River have been considered in the past by MDNR as an option for interim response. The MDNR is reevaluating the remediation plans as they relate to U.S. EPA actions at the site. The State

of Michigan filed suit in December 1987 against Allied Paper, Inc., its parent company, SCM Corp., and other potentially responsible parties (PRPs) concerning the PCB contamination of the Bryant Mill Ponds. Litigation is still in process. The Allied Paper, Inc./Portage Creek/Kalamazoo River site was listed on the U.S. EPA's National Priorities List (NPL) in August 1990.

B. Other Contamination Sites in the Area

An estimated 40 sites listed under the Michigan Environmental Response Act (Act 307) may directly impinge on the Kalamazoo River within API/PC/KR. Remediation of most of these sources will be implemented separately from the API/PC/KR site remediation, though some of them may be included within this site's remediation plan, as the U.S. EPA and the Michigan Department of Natural Resources (MDNR) deem appropriate. A number of Act 307 and other waste disposal sites in the vicinity of the API/PC/KR site are shown on Figure 3. The Willow Boulevard, "A", and Kings Highway sites, which are sludge disposal areas for a Georgia Pacific paper plant located approximately 1.5 mile upstream from Portage Creek on the Kalamazoo River, are among other potential sources of contamination of the river. Remediation at these sites is the subject of planning and negotiation between Georgia Pacific and the MDNR, outside the Act 307 process. The Auto Ion NPL site is located on the Kalamazoo River less than a mile upstream of Portage Creek. The Michigan Disposal Company NPL site, a/k/a the Cork Street Landfill, is approximately 1.5 mile east-southeast of the API/PC/KR site. The Rockwell International NPL site in Allegan, Michigan, is on the bank of the Kalamazoo River near the downstream end of API/PC/KR. The Strebor site, adjacent to the Allied Paper site on the west, is currently being remediated for ground-water contamination under MDNR supervision in the Act 307 program. The Kalamazoo River downstream through Lake Allegan to the river mouth at Saugatuck, on Lake Michigan, is also being studied by the MDNR and other State, Federal, and international agencies, separately from the API/PC/KR program, regarding the effects of contamination from the API/PC/KR area and elsewhere on the river.

C. Site Visit

John Filpus from the MDPH and MDNR personnel toured the AP/PC/KR site with a representative of Allied Paper on February 26, 1990. A verbal summary of company waste disposal procedures was given and the visitors received a car tour of the site. The MDPH and MDNR personnel then visited the sites of two of the dams on the Kalamazoo River. Information obtained on this visit is included in the observations, conclusions and recommendations in this document.

D. Demographics, Land Use, and Natural Resource Use

API/PC/KR lies within a moderately dense demographic area encompassing several thousand people. The City of Kalamazoo, with a population of 80,000, surrounds the Allied Paper Disposal Area and the stretch of Portage Creek from the Disposal Area downstream to its confluence with the Kalamazoo River. The Kalamazoo River within API/PC/KR flows through the cities of Kalamazoo, Parchment (population 2,000), Plainwell (3,800), Otsego (4,000), and Allegan (4,700). The majority of Kalamazoo and all of the other cities mentioned lie

within 3 miles of either the Kalamazoo River or Portage Creek. The City of Portage, with a population of 40,000, adjoins Kalamazoo on the south, and their common city limits are a mile south of the Allied Paper site. The cities of Saugatuck (population 1,100) and Douglas (950) are on the Kalamazoo River near its mouth, and their residents may be exposed to contaminants transported out of API/PC/KR.

Most of the land use east of Portage Creek at the Allied Paper site is residential. The area across the railroad tracks from the site to the west is a mix of industrial, commercial, and residential properties. North of the site the land use is industrial, south of the site it is mixed light commercial and residential.

Land use along the Kalamazoo River within API/PC/KR includes urban commercial and industrial ; urban, suburban, and rural residential; agricultural; and recreational purposes. The river is used for swimming, boating, and fishing. River water is used for industrial and agricultural purposes. No municipal water supplies draw on the river within API/PC/KR. The Kalamazoo River flows through the Allegan State Game Area downstream of API/PC/KR.

E. Health Outcome Data

Based on the evaluations performed as part of this public health assessment, there are indications that humans have been exposed to site-related contaminants. In addition, community health concerns related to the site have been reported. Follow-up actions have been proposed by the ATSDR Health Activities Recommendation Panel (HARP). These follow-up health activities will include an evaluation of health outcome data, when warranted.

COMMUNITY HEALTH CONCERNS

The primary health concerns of citizens with regard to API/PC/KR involve the possibility of children coming into contact with contaminated sediments in the exposed areas of the Bryant Mill Ponds and the consumption of contaminated fish from Portage Creek and the Kalamazoo River. There are also strong concerns regarding the physical and chemical hazards in the Panelyte building area (not part of API/PC/KR).

Some residents in the vicinity of the Allied Paper site have reported a concern over high incidence of cancer among their neighbors. However, no documentation of cases has been received.

This preliminary public health assessment was released for public comment from January 29 through March 1, 1991. During this time a number of comments on the Draft Public Health Assessment were received. These comments and MDPH responses are included in the Responsiveness Summary which is attached to this Public Health Assessment.

ENVIRONMENTAL CONTAMINANTS AND OTHER HAZARDS

To identify possible facilities that could contribute to the ground water, surface water, soil, sediment, and air contamination near the API/PC/KR site, MDPH searched the 1987, 1988, and 1989 Toxic Release Inventory (TRI). TRI is developed by the U.S. EPA from chemical release information provided by certain industries. Although TRI indicated a number of airborne releases of chemicals within the API/PC/KR site zip code area, the reported releases are unlikely to have impacted contaminant levels in on-site or off-site areas.

A. On-Site Contamination

The primary contaminants present at API/PC/KR are polychlorinated biphenyls (PCBs). PCBs have been found in the water, sediment, and fish of Portage Creek and the Kalamazoo River, including the sediment now exposed in the drained impoundments of the Bryant Mill Ponds and Plainwell, Otsego, and Trowbridge dams. Soils and wastes at the Allied Paper and Simpson Plainwell Sludge disposal areas have also been found to contain PCBs. Table 1 lists total PCB concentrations from selected sediment, water, and fish samples collected within API/PC/KR, from the Bryant Mill Ponds to Lake Allegan.

1. Sediments

The residual wastes at the Allied Paper site contain measured PCB concentrations as high as 1,200,000 parts per billion (ppb). The sediments in the Bryant Mill Ponds contain similar levels, measured as much as 1,000,000 ppb. PCB levels in the sediment in Portage Creek below the ponds have been measured as high as 117,610 ppb. Local maximum concentrations in Kalamazoo River sediments have been measured in the range of 50,000 to 100,000 ppb, though sediment in some fast-flowing reaches have not shown detectable levels of PCBs. The PCB levels measured in the sediments are similar in each of the impoundments along the river. The total mass of PCBs in river sediments, including Lake Allegan, has been estimated at 350,000 pounds.

Some of the highest PCB concentrations are found well below the surface of sediment beds and waste deposits. The 1,200,000 ppb level in the waste mentioned above was found at 14 feet below ground level, and the 1,000,000 ppb in the sediment at 1 to 2 feet deep. The sediments in Bryant Mill Pond show contamination at over 100,000 ppb at depths as much as 4 feet, and 25,000 ppb as deep as 5 feet. Behind the Allegan City Dam, near the downstream end of API/PC/KR, 29,000 ppb of PCBs were found 7 feet below the surface. Surface and near-surface samples often contain PCBs at levels of concern as well. Table 1 soil and sediment entries, when a depth is not given, are from surface samples.

2. Surface Water

In surveys conducted between 1985 and 1987, the maximum PCB levels (0.3 ppb) in surface water were found in Portage Creek at the Alcott Street dam, the downstream end of the old Bryant Mill Pond area. The levels dropped to 0.04 ppb in the Kalamazoo River downstream of the confluence with Portage Creek, but rose again to approximately 0.1 ppb at 10th Street and were approximately constant from there downstream. Other potential sources of PCBs along the river may have contributed to the extent and level of contamination.

3. Biota

Fish from Portage Creek and the Kalamazoo River were first found to contain PCBs at high levels in 1971 (Table 1). Carp, because they are bottom feeders with fatty flesh, have tended to contain the largest amounts of these chemicals, with a maximum concentration of 164,500 ppb in fish sampled in 1971. The PCB levels have declined since the earliest samples, but the rate of decline has decreased through the 1980s.

Waterfowl collected in the Kalamazoo River have been analyzed for PCB content on a limited basis. Tables 1 and 2 include the maximum levels found in various locations in 1985 and 1986. The highest level found within and downstream of the API/PC/KR site was 4,800 ppb in a mallard duck from the Otsego City Impoundment. A merganser from Morrow Pond, upstream of Kalamazoo on the Kalamazoo River, contained 28,000 ppb. Mute swan eggs from the Allegan State Game Area contained up to 1,600 ppb. Breast meat from a mallard collected from the Allegan State Game Area in the fall of 1988 contained 290 ppb PCBs with the skin on, none detected (less than 50 ppb) with the skin off.

4. Ground Water

Water samples from one monitoring well (MW 5 in Figure 2) at the Allied Paper site have shown detectable PCBs since 1986. In a sample taken from this well in 1989, 3.3 ppb total PCBs were found, of which 0.18 ppb was in the dissolved component. A sample from the same well taken earlier that year contained 0.23 ppb dissolved PCBs. MW 5 was located in the sediment beds of Bryant Mill Pond, and it was screened less than 7 feet below the surface. No PCB contamination was found in an adjacent well (MW 112), screened between 10 and 13 feet below grade. Water from a test pit in the pond sediments contained 2.9 ppb PCBs and 238,000 ppb iron before filtering, and less than 0.1 ppb PCBs and not more than 12,300 ppb iron after filtering.

A number of apparently independent contamination plumes have been found in the ground water under the Allied Paper site. Water from one well in the northern section of the site (MW 30) contained pentachlorophenol (88 ppb), ethylbenzene (32 ppb), toluene (4.7 ppb), and xylenes (148 ppb total). This contamination has been linked to the Strebor site, immediately to the west of the northern end of the Allied Paper site. At the Strebor site, ground water contaminated with these chemicals is being remediated by Strebor, the owner/operator of a plant on the site, under MDNR oversight. Another ground-water contaminant found at the Allied Paper site is tetrachloroethylene, found at levels up to

30 ppb in 1989 in three closely spaced monitoring wells (MW 113a, MW 114, and TW 2 [Figure 2]) located between the landfill and the Panelyte building.

A pair of ground-water seeps were found in late 1985 on the bank of Portage Creek at the Allied Paper site (see Figure 2). One of these contained PCB levels as high as 4.389 ppb, and the other up to 0.051 ppb. The surface soils near the first seep contained up to 260,000 ppb PCBs. The first seep hasn't flowed since late 1986, and the second hasn't shown contamination since late 1985. In late 1989, while digging the test pit mentioned above, investigators discovered and observed a third ground-water seep, which filled the pit with water containing metal concentrations above background, e.g. 143 ppb chromium, 25,500 ppb aluminum, 134 ppb nickel, 810 ppb lead, and 114,000 ppb iron. Unfiltered water from the test pit also contained 162 ppb chromium, 50,400 ppb aluminum, 133 ppb nickel and 744 ppb lead, and filtered water from the pit no more than 5 ppb chromium, 499 ppb aluminum, 13 ppb nickel, and 5.2 ppb lead.

B. Off-Site Contamination

Lake Allegan sediments have shown as much as 41,700 ppb of PCBs, and surveys indicate the entire lake is affected (Table 2). Downstream of Lake Allegan, the PCB levels in the sediment drop sharply, though there are detectable PCBs in the sediment and water at the river mouth at Saugatuck. The maximum levels of PCBs in the river water are relatively uniform at approximately 0.1 ppb over the length of the river. Fish PCB levels in the lower zone of the river follow the general trend noted above, declining since the earliest samples and a levelling off in recent years.

Sediment samples collected in 1984 from Monarch Mill Pond on Portage Creek upstream of the site contained only a maximum of 710 ppb PCBs. Carp collected from Morrow Pond, upstream of Kalamazoo on the Kalamazoo River, contained up to 12,690 ppb of PCBs in 1986, and up to 5,830 ppb in 1987. Sediment sampled from Morrow Pond in 1988 contained as much as 4,500 ppb PCBs at a depth of 1 to 2 feet, with surface concentrations as high as 2,400 ppb. Water from Morrow Pond contained less than 0.015 ppb (detection limit) PCBs in 1988. Carp from the Ceresco Impoundment on the Kalamazoo River, further upstream beyond the City of Battle Creek, contained a maximum of only 240 ppb of PCBs in 1987. Sediment from the Ceresco Impoundment contained less than 2,400 ppb (detection limit) PCBs in 1987. The source of the Morrow Pond contamination has not been more precisely located.

C. Quality Assurance and Quality Control

Quality Assurance and Quality Control information was not available for all the data reviewed in preparing this assessment. MDPH relied on the information provided in the referenced documents and assumed that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions drawn for this Public Health Assessment is dependent upon the reliability of the referenced information.

D. Physical and Other Hazards

The south boundary of the Allied Paper site has long been fenced, as has the area around the settling tank. Allied Paper, Inc., installed a fence around their property south of Alcott Street and west of Portage Creek, including the Panelyte property, in late 1990, in compliance with a consent order with the U.S. EPA, and the MDNR posted signs on the fence warning of the contamination. Much of the site is also posted with warnings against trespass due to unstable land. There are a number of houses along the east bank of Portage Creek across from the Allied Paper site whose back yards abut the pond bed. The closest house is less than 100 feet from the creek. The recently installed fencing encloses this area along the east bank of the creek.

The former Panelyte building (adjacent to and not part of API/PC/KR) is dilapidated, but is within the Allied Paper site fence. Trespassers entering the building would be in danger of possible collapse of the structure. The former lagoons and ponds are swampy. There are also many steep banks leading to the creek or former pond bottoms, and into the borrow pits. The narrow dikes separating the settling ponds provide the only solid ground in the lagoon and settling pond area. There is little beyond warning signs to inhibit access to the bottomlands along the Kalamazoo River within API/PC/KR.

The sills at the sites of the dismantled Plainwell, Otsego, and Trowbridge dams may pose a hazard to boaters. Trying to cross one of these sills may cause a boat to capsize. There are warning markers at the dams.

PATHWAYS ANALYSES

A. Environmental Pathways (Fate and Transport)

Significant pathways for environmental transport of contaminants from and within API/PC/KR include ground water, surface water including entrained soils and sediments, fish, wildlife, sediments and soils carried by the wind, and air.

1. Ground Water

The ground water at the Allied Paper site flows to the northeast. It converges toward and may discharge into Portage Creek. A layer of clay under much of the Allied Paper site probably confines any contaminants to the shallowest ground water. This clay lies at about 30 feet below the surface of the sediments in the settling ponds. The clay layer is approximately 50 feet below ground level in the vicinity of the landfill, and about 10 feet below the surface of the sediments in the Bryant Mill Ponds. The water level in a monitoring well screened below the clay layer was approximately 10 feet above the water level of nearby wells screened above the clay layer in the shallower aquifers. This indicates that there may be an upward pressure gradient between the shallow aquifer and a lower one.

PCBs are almost insoluble in water and tend to bind strongly to organic material. Hence, leaching of PCBs to ground water is expected to occur rarely.

PCBs have been found in ground water from one monitoring well, in a test pit in the sediments of the pond, and from two seeps. Metals were also found in unfiltered water from the test pit. Some question exists whether this was due to ground-water contamination or to PCBs and metals adsorbed to soil particles from the vicinity of the sampling suspended in the water.

2. Surface Water and Sediments

As mentioned earlier, PCBs are almost insoluble in water and tend to bind strongly to organic material. Hence, PCBs in surface water tend to adsorb to sediments. Transport of PCBs along waterways by suspended contaminated sediments is common, and is probably responsible for the broad extent of PCB contamination found in Kalamazoo River sediments.

The impoundments behind the dams in the river and creek have collected PCB-laden sediments. Two dams remain in place within API/PC/KR: the Allegan City Dam and the Otsego City Dam. The Allegan Dam, 10 miles downstream from API/PC/KR, is also currently in place. Sediments in these impoundments, in contact with the water, are vulnerable to further resuspension and dissolution of contaminants. In the drained impoundments at the Bryant Mill Ponds and Plainwell, Otsego, and Trowbridge dams, the contaminated sediments outside the current channel no longer continuously contribute to the PCB content of the water. However, erosion and flooding could periodically release PCBs from these sediments to the water. The total amount of PCBs carried into Lake Michigan by water from the Kalamazoo River has been estimated to be 200 pounds per year.

Carp and other bottom-feeding fish disturb contaminated sediments. This increases the water burden as suspended particles may carry contaminants and the newly exposed contact area will increase the rate of transfer of soluble contaminants from the sediments to the water. Lake Allegan and other zones of the river within the defined site area have large carp populations.

3. Biota

Fish, waterfowl, turtles, raccoons, opossums, and other wildlife that live in close association with the river are also subject to PCB uptake and accumulation through the food chain.

4. Air

The major contaminants at the site, PCBs, are not particularly volatile. The most likely potential pathway for airborne transport of PCBs is windblown contaminated dust.

B. Human Exposure Pathways

The potential pathways for human exposure to the contaminants at this site include: ingestion of and dermal contact with surface and ground water; incidental ingestion of and dermal contact with soil and sediment; inhalation of volatile contaminants and contaminated dust; and ingestion of contaminated biota.

Ground water is the main source for potable water in the area. Six City of Kalamazoo municipal well fields are within 1 mile of the Allied Paper site, five to the north or northwest, and one to the southeast. Seven more well fields are within 3 miles, four to the southeast and one each to the northeast, south, and southwest. These well fields are shown in Figure 3. Three of the baseline supply fields for the City water supply system are within 1 mile of the site, to the north-northwest. The remainder described above are reserve wells primarily used at peak periods. The wells typically are 150 to 200 feet deep, within the glacial drift or water table aquifer, and are vulnerable to surface contamination sources. Several municipal wells have been contaminated in the past with volatile organic chemicals or coliform bacteria. PCBs have not been found in these wells. None of this contamination has been linked to the API/PC/KR site.

Municipal water is available to all residences in the area of the Allied Paper site. As far as Kalamazoo County Human Services Department (KCHSD) personnel can determine, all residences in the area are connected to municipal water. KCHSD personnel know of no private wells in use in the vicinity of the Allied Paper site, though residents may use private wells to supplement the municipal water supply without there being any official record. No survey for private well use in the area is on record.

One of the Kalamazoo City reserve well fields mentioned above is located approximately 500 feet from Portage Creek downstream of the Allied Paper site. The baseline fields are less than 1.5 mile from the creek. It is not known whether contamination in the creek water could reach the wells during times of high well pumpage rates if the creek recharges the water table aquifer.

A City of Allegan municipal well field and a private well in the Allegan area are located within 1,000 feet of the Kalamazoo River, near the downstream end of API/PC/KR. A hydrogeological analysis indicates that these wells tap an aquifer that is recharged with water from the river (1). Contamination in the river water might reach these wells, and people using water from them might be exposed to the contaminants. No contamination has been found in annual testing of the municipal wells by the MDPH (2). As mentioned above, PCBs tend to adsorb to organic materials in soil and sediment. There should be very little migration of PCBs through an aquifer.

Surface water is not used for municipal water supplies in the area. However, water is drawn from the river for industrial and agricultural purposes. The Performance Paper (the former Allied Paper) plant has a process water intake on Portage Creek, at the south (upstream) end of the Allied Paper site. MDNR personnel have reported that there is at least one agricultural intake downstream of Plainwell. Agricultural water intakes are not registered in the

state of Michigan. There have been reports of cattle having access to the exposed sediment beds in the drained impoundments.

Recreational use on the river downstream from Kalamazoo includes swimming, boating, and fishing. However, dermal contact with sediments and water and incidental ingestion of water would be an insignificant route for exposure due to the low solubility of PCBs in water and limited absorption through the skin.

Fencing has been installed which will completely restrict future unauthorized access to the Allied Paper site, including the Panelyte property. There is evidence of past trespass (graffiti on the Panelyte building and vehicle tracks). Young people reportedly have operated all-terrain vehicles on the site. Much of the site is also posted with warnings of unstable land. Trespassers on the site in the past have likely had some exposure to contaminants through contact with and incidental ingestion of contaminated soils and inhalation of contaminated dust. Access to the former impoundments along the river is not effectively restricted, raising the same possibility but at lower levels of contaminants. In July 1990, the MDNR posted the former bottomlands at the drained impoundments along the Kalamazoo River, warning of contamination of the sediments.

The major contaminants at the site, PCBs, are not particularly volatile. Inhalation is likely to be an important pathway for human exposure to PCBs only in the case of windblown contaminated dust. Because most exposed and deposited waste material sediment areas are well vegetated, fugitive dust transport of contaminants is expected to be minimal.

The fish consumption advisory is not legally binding, and the possibility of some anglers disregarding the advisory and frequently consuming fish from the river with high PCB content cannot be ruled out. MDPH personnel have observed that the Kalamazoo River between Kalamazoo and Plainwell is becoming a popular fishery. It has been reported that anglers have been taking home fish in amounts that may be inconsistent with the consumption advisories issued by the MDPH.

It has been reported that turtles have also been taken from the river for human consumption. There is no contaminant data on turtles from the river but turtles from other areas of PCB contamination have sometimes been found to be highly contaminated (3,4). Hence consumption of contaminated turtle meat provides another potential human exposure pathway.

A potential human exposure pathway to contaminants in the river water and sediment may arise through the consumption of cattle or other livestock that are watered in the river or which graze on contaminated exposed sediment areas. Though PCBs are only very slightly soluble in water, livestock may roll up and ingest contaminated sediment in the process of drinking from the river. They may also ingest contaminated soil with uprooted forage plants.

Food crops irrigated with contaminated water may also take up and accumulate contaminants, particularly metals. PCBs from contaminated irrigation water may adhere to the surface of the plants. Consumption of the crops or of

animals fed on the crops may expose humans to the contaminants. Because PCBs are only very slightly soluble in water, irrigation with PCB-contaminated water is not likely to contaminate plants...

PUBLIC HEALTH IMPLICATIONS

The polychlorinated biphenyls (PCBs) are a group of 209 related compounds (or congeners) that have been produced commercially in mixtures with various chlorine percentages. The more chlorinated congeners tend to be more toxic, stable, water-insoluble, lipophilic, bioaccumulative, and persistent in the environment than other congeners.

Animal studies have shown that exposure to some PCB mixtures by ingestion, inhalation, and dermal contact can produce adverse health effects including liver damage, skin irritation, reproductive and developmental effects, and cancer. For humans, exposure in occupational settings, primarily by inhalation and dermal contact, has led to chloracne and rashes. There is limited evidence that occupational exposure to PCBs may be related to reproductive and developmental effects and cancer of the liver, skin, and brain (5,6). Limited studies have linked consumption of PCB-contaminated fish with reproductive and developmental problems. All PCB mixtures are classified by the U.S. EPA as probable human carcinogens (Class B2). The evidence from animal studies is adequate to conclude that certain PCBs are carcinogenic in animals, but the evidence from human studies is insufficient to draw any conclusion.

The health effects of exposure to many PCB congeners have not been identified. More important, the exact composition of any sample PCB mixture may not be known, especially in the environment. Congener-selective environmental degradation and transport may alter the composition of a PCB mixture. Congener-selective uptake, metabolism, and retention also influences the health effects of exposure to a PCB mixture. Due to the difficulty of congener-specific analysis, health advisories and regulations are generally based on total PCB content.

The PCB compounds are strongly lipophilic, and tend to bioaccumulate, especially in fatty tissues. Consumption of contaminated food can greatly increase body burdens over time. A survey comparing Michigan residents who regularly eat fish with those who do not found no significant difference in health history, despite a three-fold difference in median serum PCB levels (7). Other studies have found a significant reduction in birth size and gestational age possibly associated with prenatal PCB exposure (8). PCBs may be transmitted through the placenta or breast milk from mother to fetus or child. The potential developmental effects of such exposure warrant further investigation.

Studies at several other PCB-contaminated sites in Michigan have shown that there is minimal uptake of PCBs from dermal contact with contaminated soil or sediment. Soil or sediment at these other sites contained much higher concentrations of PCBs than has been found at API/PC/KR.

The water concentrations of PCBs documented in the Kalamazoo River and Portage Creek have exceeded the Ambient Water Quality Criteria for surface water issued by the U.S. EPA (0 [0.0126 ppb])¹, and the MDNR Rule 57 Surface Water Criteria (0.00002 ppb), but are below a proposed Safe Drinking Water Act Maximum Contaminant Level (MCL) for these chemicals (0.5 ppb). The total PCB concentration found in the shallow unfiltered ground water at the Allied Paper site exceeds the proposed MCL and, incidentally, the Ambient Water Quality and Surface Water Criteria cited above. The concentration in filtered groundwater is below the MCL but above the Ambient Water Quality and Surface Water Criteria.

The maximum levels of PCB contamination detected in fish from the Kalamazoo River and Portage Creek exceed the U.S. Food and Drug Administration limit for commercial sale and the MDPH trigger level for fish consumption advisories (both 2,000 ppb). People who regularly eat fish containing elevated levels of PCBs probably are at a greater risk of the adverse health effects described above. Of particular concern are possible developmental effects on unborn or young children.

The concentrations of pentachlorophenol and other aromatic hydrocarbons found in the ground water in the northern part of the Allied Paper site are below established or proposed MCLs, though the pentachlorophenol and xylene levels exceed proposed Secondary (non-health-based) MCLs. The tetrachloroethylene concentration does exceed the proposed MCL of 5 ppb. The metals concentrations found in the third ground-water seep exceeded established or proposed drinking water standards. However, no public or private water supplies utilize water from this contaminated area.

- CONCLUSIONS

Based upon information reviewed, this site is a public health hazard because of the probable exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Pathways Analysis Section above, human exposure to PCBs may be occurring and may have occurred in the past via contact with and incidental ingestion and inhalation of contaminated soils and ingestion of contaminated biota. An additional risk arises from the physical hazards on some portions of the site, with dilapidated buildings and unstable land. The most hazardous areas have been fenced.

¹ For any Class B2 carcinogen, the Ambient Water Quality Criterion is officially 0, as a goal. It is estimated that lifetime consumption of water containing 0.0126 ppb of PCBs would pose a 10^{-6} lifetime cancer risk, based on water consumption alone. If you consumed aquatic biota that lived in the water as well as water containing 0.000079 ppb PCBs, the estimated total cancer risk would be 10^{-6} .

RECOMMENDATIONS

1. The MDPH supports remediation of the contaminated sediments in the Bryant Mill Ponds and the impoundments on the Kalamazoo River. Care should be taken in the planning and design to ensure the effectiveness of the remediation and in its execution to protect public health, workers, and the environment. Transport of contaminants out of the areas under remediation should be controlled by suppression of dust and prevention of resuspension of sediments in the river and creek.
2. Monitoring of PCB contamination in fish, waterfowl, and other fauna using the river system should continue, and should be expanded to include turtles and other fauna of commercial or recreational importance. Consumption advisories should be more intensively publicized at the local level.
3. A survey of Kalamazoo River anglers, determining how much they fish and how much and what kinds of fish they catch and eat, should be considered to establish their levels of exposure to contaminants in the fish. Local organizations, such as the Kalamazoo River Protection Association, may be a source of assistance in identifying and enrolling survey participants.
4. Ground water in the area of the detected tetrachloroethylene contamination should be further studied to determine the source, extent, and appropriate remediation of this contamination. The third ground-water seep should be investigated to identify the source of the heavy metal contamination and determine appropriate remediation. Investigation and remediation of the pentachlorophenol contamination at the Allied Paper site should be carried out in coordination with the Strebtor site remediation.
5. The hydrology of the entire NPL site should be further studied to fully characterize the potential impact of the site contaminants on ground water and ground-water-based water supplies.
6. A survey should be carried out to confirm that no private wells are in use in the area of the Allied Paper site.
7. This site has been evaluated by the ATSDR Health Activities Recommendation Panel for appropriate follow-up with respect to health effects studies. Because human exposure to site contaminants at levels of public health concern may currently be occurring and has occurred in the past, this site is being considered for a study to investigate fish ingestion and serum PCB levels. Prior to conducting an exposure study, it is recommended that the number of people eating fish from the Kalamazoo River and Portage Creek be more clearly defined. The need for and type of other follow-up health activities will be determined after the fish eating populations are defined.
8. If future ATSDR evaluations indicate that a substantive completed exposure pathway exists or that the community has expressed specific

health concerns, then health outcome data bases should be evaluated in future assessments for this site.

PREPARERS OF REPORT

John W. Filpus
Environmental Engineer
Michigan Department of Public Health

James Bedford
Environmental Toxicologist
Michigan Department of Public Health

John L. Hesse
Principal Investigator
Michigan Department of Public Health

Brendan Boyle
Health Assessment Coordinator
Michigan Department of Public Health

ATSDR REGIONAL REPRESENTATIVE

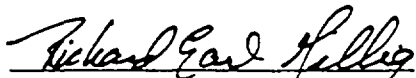
Denise Jordan-Izaguirre
Regional Services, Region V
Office of the Assistant Administrator, ATSDR

ATSDR TECHNICAL PROJECT OFFICER

Richard Gillig
Environmental Health Scientist
Division of Health Assessment and Consultation
Remedial Programs Branch

CERTIFICATION

This Preliminary Public Health Assessment was prepared by the Michigan Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.



Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Preliminary Public Health Assessment and concurs with its findings.



Director, DHAC, ATSDR

REFERENCES

1. Remcor, Inc., "Draft Remedial Investigation and Risk Assessment, Rockwell International Corporation, Allegan, Michigan," November 5, 1990.
2. Telephone conversation with Don Greiner, District Engineer, MDPH Water Supply Division, December 6, 1990.
3. Stone, W. B., Kiviat, E., and Butkas, S. A., "Toxicants in Snapping Turtles," *N. Y. Fish and Game J.*, 27(1), 39-50 [1980].
4. Bryan, A. B., Stone, W. B., and Olafsson, P. G., "Disposition of Toxic PCB Congeners in Snapping Turtle Eggs: Expressed as Toxic Equivalents of TCDD," *Bull. Environ. Contam. Toxicol.*, 39, 791-6 [1987].
5. ATSDR, "Toxicological Profile for Selected PCBs (Aroclor-1260, -1254, -1248, -1242, -1232, -1221, and -1016)," ATSDR/TP-88/21, June 1989.
6. NIOSH, Health Hazard Evaluation Report, Westinghouse Electric Corporation, Bloomington, Indiana, HETA 89-116-2094, January 1991.
7. Humphrey, H. E. B., "Chemical Contaminants in the Great Lakes: The Human Health Aspect," in Evans, M. S., ed., *Toxic Contaminants and Ecosystem Health*, Wiley, N. Y., pp. 153-164, [1988].
8. Fein, G. G., Jacobson, J. L., Jacobson, S. W., Schwartz, P. M., and Dowler, J. K., "Prenatal Exposure to Polychlorinated Biphenyls: Effects on Birth Size and Gestational Age," *J. Pediatrics*, 105(2), 315-320 [1984].
9. Tom Flanagan, a former Allied Paper, Inc., Vice President.
10. Steve Luzkow, MDNR Site Manager.
11. Scott Cornelius, MDNR Site Manager.
12. Chris Waggoner, MDNR Surface Water Quality Division.
13. William Creal, MDNR Surface Water Quality Division.
14. MDNR District 12 staff.
15. William Speeter, R.S., Sanitarian, Kalamazoo County Human Services Department.
16. MDNR files.
17. MDPH files.

18. Michigan Department of Natural Resources (MDNR), "Kalamazoo River Remedial Action Plan, Second Draft," December 1987.
19. Peterson, Gregory W., to Jon F. DeWitt, Memorandum re: 1988 Portage Creek Sediment Survey Laboratory Reports, Limno-Tech, Inc., September 15, 1988.
20. Wilkins & Wheaton Environmental Services, "Addendum I to the Hydrogeologic Investigation for the Allied Paper, Inc., Sanitary Landfill, Kalamazoo, Michigan," October 1988.
21. MDNR Surface Water Quality Division, "Fish Contaminant Monitoring Program 1989 Annual Report," December 1989.
22. Limno-Tech, Inc., and United Environmental Technologies, "Report on the H.M. Holdings/Allied Paper Investigations of the Historical Residuals Dewatering Lagoons and 'Seeps 1 and 2'," January 1990.
23. United Environmental Technologies, "Addendum II to the Hydrogeologic Investigation for the Allied Paper, Inc., Sanitary Landfill, Kalamazoo, Michigan," January 31, 1990.
24. Limno-Tech, Inc., "HM Holdings/Allied Paper, Inc.: Results of the Stream Diversion Design Studies, Portage Creek in Bryant Mill Pond," February 15, 1990.
25. Valdas V. Adamkus, U.S. EPA, letter to Raj M Wiener, MDPH, July 11, 1990.

Table 1. Selected total PCBs concentrations found in the Allied Paper/
Portage Creek/Kalamazoo River site

<u>Location</u> ²	<u>Medium</u>	<u>Date</u>	<u>Concentration</u> ³ (ppb)
Allied Paper	groundwater	5/6/88	0.790
Landfill	soil ⁴ (6-7')	6/15/88	80
	waste (14')	1989	1,200,000
Bryant Mill Ponds	sediment ⁵	1972	368,700
		11/2/83	582,000
		4/3/84	898,000
		10/15/85	530,000
		8/6/86	980,000
		1987	74,000
	(1-2')	6/22/88	1,000,000
	(surface)	6/24/88	440,000
	groundwater	10/4/89	0.070
	soil (10')	8/3/89	3,300
	fish		
	carp	7/85	4,500
		7/86	27,370
		7/14/87	5,500
PC - Alcott St.	water	5/6/85	0.283
		7/29/85	0.335
PC - Lake St.	sediment	1972	117,610
PC - Vine St.	sediment	8/76	55,580
	fish		
	carp	9/81	1,000
	wh. sucker	9/81	7,600
PC - Michigan Ave.	sediment	8/76	500
		11/82	85,000
		11/83	15,000
KR - Paterson Ave.	water	10/15/85	0.042
		6/24/86	0.037
	sediment	11/82	57,000
		1984	13,000

² PC - Portage Creek
KR - Kalamazoo River

³ Maxima in medium near location and date.

⁴ Surface unless depth noted.

KR - Mosel Ave.	water	6/24/86	0.044
		3/24/87	0.041
	fish	/--	
	carp	7/71	164,500
		6/76	8,000
		9/81	7,700
		7/83	6,530
		7/85	10,800
		7/86	11,090
	sm. bass	9/81	2,130
		7/85	1,890
	wh. sucker	7/71	56,890
KR - D Ave.	water	5/20/87	0.030
	sediment	8/9-10/76	10,300
		11/82	1,600
KR - 10th St.	water	7/22/85	0.110
		5/13/86	0.153
		5/20/87	0.097
KR - Plainwell Dam	water	5/20/85	0.062
		5/13/86	0.091
	sediment	11/83	55,900
	fish		
	carp	7/71	22,310
		6/76	13,800
		9/81	9,200
KR - Plainwell Dam (cont.)			
	carp	7/83	15,900
		7/85	12,500
		7/86	9,460
		7/14/87	17,120
	wh. sucker	7/71	21,250
		8/76	4,300
KR - Otsego	sediment	1987	120,000
KR - M-89	sediment	8/76	66,600
		1982	27,000
KR - Otsego Dam	water	4/18/85	0.122
	sediment	5/29/85	57,000
	fish		
	carp	7/71	58,720
		8/76	11,800
KR - Otsego Dam	fish		
	sm. bass	8/76	1,500
	wh. sucker	7/71	12,680
		8/76	4,000
	ducks	8/85	4,800

KR - Farmer St.	water	7/22/85	0.090
KR - Trowbridge Dam	sediment	6/83	81,000
	(14-18")	11/83	50,900
	(surface)	11/83	44,200
	fish		
	carp	7/71	4,060
	wh. sucker	7/71	12,140
	nor. pike	7/71	8,220
	ducks	8/85	1,900
KR - 26th St.	water	4/18/85	0.126
KR - Williams Rd.	water	4/18/85	0.119
KR - Allegan	sediment	8/9-10/76	24,670
	(5')	5/29/85	57,400
	(surface)	5/29/85	47,300
KR - M-118	water	6/24/85	0.193
		5/13/86	0.149

Table 2. Selected total PCBs concentrations found in the Kalamazoo River outside of the site area

<u>Location</u>	<u>Medium</u>	<u>Date</u>	<u>Concentration⁵</u> (ppb)
Lake Allegan	sediment ⁶	8/9-10/76	24,670
		11/83	41,700
		1987	14,000
	fish		
		carp	
		7/71	7,320
		8/76	7,400
		9/81	47,000
		7/83	5,030
		7/85	14,000
		7/86	13,340
		7/14/87	6,140
		bass	
		8/76	2,400
		9/81	2,200
		7/85	6,540
		sm. bass	
		7/14/87	5,140
Below Allegan Dam	water	7/71	13,440
		8/76	2,100
	nor. pike	7/14/87	3,090
		7/71	13,770
		8/76	7,400
	wh. sucker	7/71	10,650
		8/76	
	bullhead	7/71	
Allegan State Game Area	water	5/29/85	0.152
		5/13/86	0.174
Koopman Marsh	duck	8/85	1,500
		1986	1,600
Kalamazoo River	sediment	1/85	1,110
Kalamazoo River	sediment	6/85	1,400
New Richmond	water	4/15/82	0.079
U.S.-31	water	4/15/82	0.121
		7/22/85	0.060
		5/13/86	0.103

⁵ Maxima in medium near location and date.

⁶ Surface unless depth noted.

Saugatuck	sediment	1982	1,740
	water	1971-2	0.065
		11/6/80	0.070
		5/15/81	0.090
		4/15/82	0.098
	fish		
	carp	7/71	45,400
		7/76	36,000
		5/78	231,000
		9/81	16,000
		7/83	25,700
		7/85	9,120
		7/86	8,990
		7/13/87	8,640
	bass	7/76	34,100
		9/81	15,000
		7/85	2,970
	lm. bass	3/31/87	2,020
	rock bass	7/71	10,100
		3/31/87	520
	nor. pike	7/71	8,700
		8/76	4,700
		5/78	10,900
		9/81	900
		3/31/87	3,360
	wh. sucker	7/71	45,500
		5/78	6,400
		3/31/87	2,820
	ducks	8/85	1,900

APPENDICES

RESPONSIVENESS SUMMARY
FIGURES

Comments from Mark Brown, Blasland and Bouck Engineers:

The page numbers in these comments refer to a double-spaced copy of the draft assessment, rather than the reprinting that was released to the repositories.

Comment 1: In the background section of the report, which begins on Page 2, the term "site" is used interchangeably to describe the Superfund site and the area which will be included in the scope of the remedial investigation. The distinction between the National Priorities List (NPL) "Site" and the area to be included within the remedial investigation should be clarified. Otherwise, the reader may get the impression that the Simpson Plainwell Paper Mill and the Performance Paper Mill are Superfund sites. They are not. In addition, the interchangeable use of the term "site" in the conclusions (page 32) could lead the reader to believe that a fence will be constructed around the entire NPL site.

Response: The definition of this site has been evolving during the time the public health assessment was developed. The descriptions in the public health assessment were paraphrases of statements from the MDNR site manager. According to the U.S. EPA and the MDNR, the Simpson Plainwell and Performance Paper Mills are part of the NPL site. Any remaining confusing terminology has been clarified in the final draft.

Comment 2: The assessment states (page 4) that discharges from the Performance Paper Plant have been drastically reduced due to changes in paper processing methods and due to declining operations at the plant. This does not reflect current conditions. The discharges stopped when Performance Paper Inc. ceased operations.

Response: Information about the current status of the Performance Paper Plant has been included in the final draft.

Comment 3: On page 6, it is correctly noted that paper-recycling and drinking operations at the Plainwell Mill continued to 1962. However, the same sentence states "from 1957 to the mid-1970's the input presumably included carbonless carbon paper whose ink contained PCBs." The sentence should be corrected to read "from 1957 to 1962, [the] input presumably ..."

Response: This sentence has been corrected in a revision of the document.

Comment 4: Allied Paper, Inc., never owned the property south of Alcott Street referred to as the Panelyte property (see page 6 of the document, last paragraph). Since the "Panelyte" property is not part of the site it is somewhat confusing and misleading to include descriptions of that property in this assessment. We do not believe that the data concerning that site was considered in performing this assessment.

Contrary to the statement found on page 7 in the second full paragraph, Allied Paper, Inc. never owned the property now owned by Stryker.

Response: Statements from Tom Flanagan, formerly of Allied Paper, Inc., to MDPH and MDNR personnel indicated that Allied Paper did once own both

properties. The parcels in question were part of the property associated with the Bryant and Monarch Mills that has had a series of corporate owners, including Time, Inc., St. Regis Paper, and Allied Paper, Inc.. Time, Inc., sold the Stryker property to Stryker on June 1, 1949. We have not done a title search to determine just how Reliance Universal (Panelyte) acquired their property. We have revised the text to describe the parcels as once belonging to "Allied Paper or one of its predecessor companies."

Comment 5: With regard to the first full paragraph on page 7: It would be more relevant to discuss the PCB spill that occurred on the Panelyte property near Bryant Mill Pond, as reflected by MDNR files than the history of leaks inside the Panelyte building. The leaks inside the building do not appear to be relevant to an assessment of the Allied Paper/Portage Creek/Kalamazoo River Site.

Response: This comment was the first information we had about the other spill. The MDNR site manager says MDNR staff is unaware of any other PCB spill. Based on information received from the MDNR and U.S. EPA, it seems likely that the Panelyte property will be included in the NPL site when the ownership question is resolved.

Comment 6: The discussion of the causes and effects of drawing down the three state-owned impoundments, on pages 7 and 8, appears to be historically inaccurate. The draft report states that "the impoundments were drained in the early 1970's due to potential dam failure." Well-documented events from the late 1960s and early 1970s, including dam safety inspection reports and MDNR correspondence, show that in the late 1960s the dams were structurally sound. MDNR's inability to maintain the structures created a situation which, over the long-term, would have increased the potential for failure. However, the dams were certainly repairable when they were demolished in 1987. Indeed, in the early 1980s a number of utilities expressed interest in redevelopment of hydroelectric power at the dams. An application for redevelopment at the Otsego Dam was blocked by MDNR in 1984. As late as December 1986, the Allegan County Board filed suit to block the demolition citing the potential opportunities for redevelopment of the hydroelectric facilities.

The only noted environmental effect of the drawdown cited by the report is "reducing the contact between the river water and the PCB-contaminated sediment." Other obvious effects that the report neglects to mention are the increase of sediment-carrying capacity of the river through the former impoundments and the erosion of bed sediments. A portion of those sediments contained PCBs which were transported to downstream areas. While it appears that the MDNR's official position has been that drawdown would be beneficial with regard to transport of PCBs, this has not been demonstrated. Indeed, alternative hypotheses appear to be just as plausible.

Response: The descriptions in the draft were based on information obtained from the MDNR. They have been verified and rectified with these comments in mind in the final draft. The public comment draft (p. 22) does mention continued erosion from the sediments in the impoundments.

Comment 7: On page 8, it is unclear what "remedial actions" the authors have in mind. Those actions should be specified.

Response: Though several source documents refer to remedial actions in the Kalamazoo River Area of Concern, we have been unable to identify what actions are referred to. The phrase has been dropped.

Comment 8: A paragraph on page 9 begins with the sentence "Remediation of the contaminated sediments in the former impoundments on the Kalamazoo River is currently being considered as an option for interim response." Subsequent sentences do not clarify this. Does this refer to the work that had been performed under P.A. 307 and the conceptual design produced during 1990? If so, is it correct to say that this is currently being considered in light of the site's transition to CERCLA?

Response: Some minor amendments have been made to help clarify this issue.

Comment 9: On page 10, it is inaccurate to state a "number of these (Act 307 sites) (are) in the vicinity of the Allied Paper site." Figure 3 is claimed to show "a number of" 307 sites on page 10. However, Figure 3 does not show them. (Also, on page 24 it is noted that well fields are shown on Figure 2. The correct figure to be cited is Figure 3.)

Response: Strebtor is on the Act 307 list, as are the other NPL sites in the area. There are 9 or so other Act 307 sites within the area covered by Figure 3. We do not necessarily have sufficient information about the other Act 307 sites to locate them on a map. As for page 24, the error has been corrected in a revised draft. The figures were switched late in the process of drafting the assessment.

Comment 10: The methods which were used to gauge community health concerns (pages 11-13) with regard to the site should be presented to assist the reader in judging the reliability of those statements. Information sources should be documented. Were interviews conducted by the authors? Were the sources personal communications from nonresidents? Are the citizens with concerns, regarding both Bryant Mill Pond sediments and Kalamazoo River, local to the Allied Paper facility or some larger area? Information characterizing the group that was interviewed should be provided.

Response: No special interviews with citizens were done for the preliminary assessment. Most of the information about community health concerns has come both from unsolicited comments that have been relayed to us and from inquiries we have made to the Kalamazoo County Health Department. For example, a local politician has reported that several constituents have complained in public meetings about various perceived health-related problems. Statements have been reported on the order of, "There's been cancer in every other house on the block," or, "I've seen more children with Down's Syndrome recently." Often the informant does not have the name of the complainant. To date no documentation has been found when attempts have been made to track the information down. To indicate the kinds of public concerns that have been associated with this site, we have included whatever statements have reached us, without regard to source.

Comment 11: It is important that the section on public health implications make better use of the results of studies of occupationally-exposed groups. The assessment previously states that the concerns have been expressed in the community regarding "high incidence of cancer." However, the report is unresponsive to that concern in the discussion of cancer risk. The description of what has been found in carefully studied groups which were exposed to relatively high levels of PCBs would probably allay those concerns if not eliminate them.

Similarly, the Michigan studies of individuals exposed to PCB-containing soils would be relevant to the possible concerns of residents regarding the risks of contact with soils.

Response: The discussion of these subjects has been expanded in the revised draft. Studies of occupationally exposed persons have not conclusively demonstrated that PCBs are not carcinogenic to humans.

Comment 12: PCB levels in sediment are misrepresented. On page 14 appears "(PCB) Levels in Kalamazoo River sediments have generally been measured in the range of 50,000 to 100,000 ppb, though sediment in some fast-flowing reaches do not show detectable levels of PCBs." The relative frequency of sediment PCB concentrations from a number of investigations summarized in the following table show that characterization to be inaccurate.

Relative Frequency Distribution of PCB Concentrations in
Kalamazoo River Sediment Samples

<u>Reach</u>	<u>Total Number of Samples</u>	<u>% Greater than 10 ppm</u>	<u>% Greater than 50 ppm</u>
Kalamazoo River, Portage Creek to Main Street, Plainwell	2	100	50
Kalamazoo River, Main Street, Plainwell to the Plainwell Dam	29	14	3
Kalamazoo River, the Plainwell Dam to the Otsego Dam	15	0	0
Kalamazoo River, Otsego Dam to the Trowbridge Dam	28	21	11
Kalamazoo River, Trowbridge Dam to the Allegan City Dam	14	57	7

Observations of more than 50,000 ppb in Kalamazoo River sediment are not generally found. In fact, they are relatively uncommon (i.e., <10%).

Response: The range cited is of local maxima. It has been clarified in the final draft.

Comment 13: An annual cycle of PCB concentrations is suggested for surface water on page 15. However, according to Limnotech, Inc., the data are too limited to statistically determine whether an annual cycle exists with any confidence. Statistical analyses have shown that the only trend that is evident and supported is one of decreasing concentrations over time.

Response: The conjectures about an annual cycle have been deleted due to this and MDNR objections. The MDNR does not agree about a downward trend over time.

Comment 14: The text which presents and discusses PCB concentrations in biota (page 16) presents only one observation, a PCB concentration of 164,500 ppb in a carp sample collected in 1971. Questions of the validity of PCB measurements from this era aside, is this in any way an accurate depiction of potential exposure concentrations? Although the history of the site is important, if only a limited amount of information can be presented in the text, the reader would be better served by a description of current PCB levels in fish.

Overall, the assessment does not present an accurate depiction of the decline of PCB levels in fish, and surficial sediments as well as the general improvements in the situation since PCBs were discovered here in 1971.

Response: Tables 1 and 2 included more recent data, which has been worked into the text during revision. The level cited was stated to be maximum over all times and locations, and the last sentence of the paragraph describes in qualitative terms the decline since the earliest measurements.

Comment 15: On page 16, second paragraph, second sentence - the correct "dissolved" PCB concentrations for this sample is 0.18 ppb, not 0.23 ppb.

Response: It has been clarified in the final draft. The 0.23 ppb figure for dissolved PCBs was from an earlier sample from the same well. (The error in Figure numbers has also been corrected in the final draft.)

Comment 16: It is appropriately noted at other locations in the document that there are questions regarding whether the "seeps" PCB result reflect solids entrained from the surrounding soils or ground-water concentrations. This qualification should also be added to the last paragraph of page 17. This comment also applies to metals. No elevated metals concentrations have been detected in the ground-water monitoring wells that are adjacent to the "seep" area.

Response: This has been clarified.

Comment 17: In the description of "Physical and Other Hazards" (page 19) the status of the fence at the Allied Paper Property as of November 1990 is presented. Although the November 1990 status was correctly portrayed, it would be much more informative to portray the current status (which was also the status as of February 19, 1991): the fence installation, enclosing this area in its entirety, has been completed in accordance with the specifications of the EPA-approved work plan. Modifications to the text on page 26 and the

conclusions section on page 32, and the recommendation on page 33 to complete the fence, are also warranted. Finally, if such physical hazards are noted in the summary (page 2) then the fencing should also be acknowledged there as well.

Response: The current status of the fencing has been verified and included.

Comment 18: Absent from the discussion of physical hazards are the recreational boating hazards posed by the sills of the three state-owned dams. Boats swept over the sills would most likely capsize exposing the occupants to probable trauma and a high risk of drowning. There appear to be no signs warning boaters of the hazards posed by the dams. MDNR staff appear to have recognized these hazards since the installation of boat-restraining devices has been contemplated.

Response: The physical hazard concerns have been included in the revised draft. MDNR personnel say that warning markers are in place, though they feel the scenario described in the comment is unlikely to occur.

Comment 19: On page 24, it is noted that a number of municipal wells have been contaminated in the past. In relation to the Allied Paper Inc./Portage Creek/Kalamazoo River site, it would also be worth noting that no municipal wells have ever been found to have PCB contamination.

Response: The sentence following the one cited, "None of this contamination has been linked to the Allied Paper site," implies the same thing. The sentence has been broadened to include all of the API/PC/KR site and PCBs have also been specifically mentioned.

Comment 20: It is understood that exposure pathways, which are conceivable but not necessarily highly probable, need to be considered. However, the discussion regarding food crop irrigation on page 28 is too unrealistic from a mass transport standpoint. The literature on plant accumulation of PCB and experience in applying municipal wastewater sludges containing PCBs to cropland also suggest that this an unrealistic concern.

Response: A sentence clarifying the unlikelihood of the pathway has been included. There has been specific public inquiry about the possibility, so it is addressed in the assessment.

Comment 21: On page 30, the USEPA Ambient Water Quality Criteria is presented and its cancer-risk basis is partially clarified. It should also be noted that the number was derived considering both fish consumption and drinking water exposure. The number has little relevance to drinking-water risks since the criteria would have been higher by a factor of 100 if only drinking-water risks were considered. The less-informed reader is likely to assume otherwise.

Response: We have added a reference to the AWQC for drinking water only (0.0126 ppb at 10^{-6} cancer risk).

Comment 22: On page 31 the report states "the total PCB concentrations found in the shallow unfiltered groundwater at the Allied Paper site exceeds all of these standards." The "standards" refer to EPA and MDNR surface water criteria and the MCL of 0.5 ppb. It is inappropriate to compare surface-water criteria to ground-water observations particularly when the criteria are essentially bioaccumulation based.

Response: We have changed the reference to the AWQC for drinking water only (0.0126 ppb at 10^{-6} cancer risk). Comparisons to standards are for information purposes only, not for health effects conclusions. If the groundwater discharges into the stream the AWQC comparison becomes relevant.

Comment 23: The recommendation that monitoring of PCB levels in waterfowl and fauna other than fish should continue, lacks a basis in current or past health advisories. During the 20 years since the discovery of PCBs in the Kalamazoo River, there have been no health advisories regarding the consumption of biota other than fish. Unlike fish data, which can be used to assess trends and the need for maintenance of consumption advisories, it is unclear how waterfowl data would be useful.

Response: A primary reason that there have been no advisories on other biota has been an absence of adequate monitoring of the other species. Because this pathway is reasonably plausible, more extensive sampling is needed to evaluate whether advisories are required.

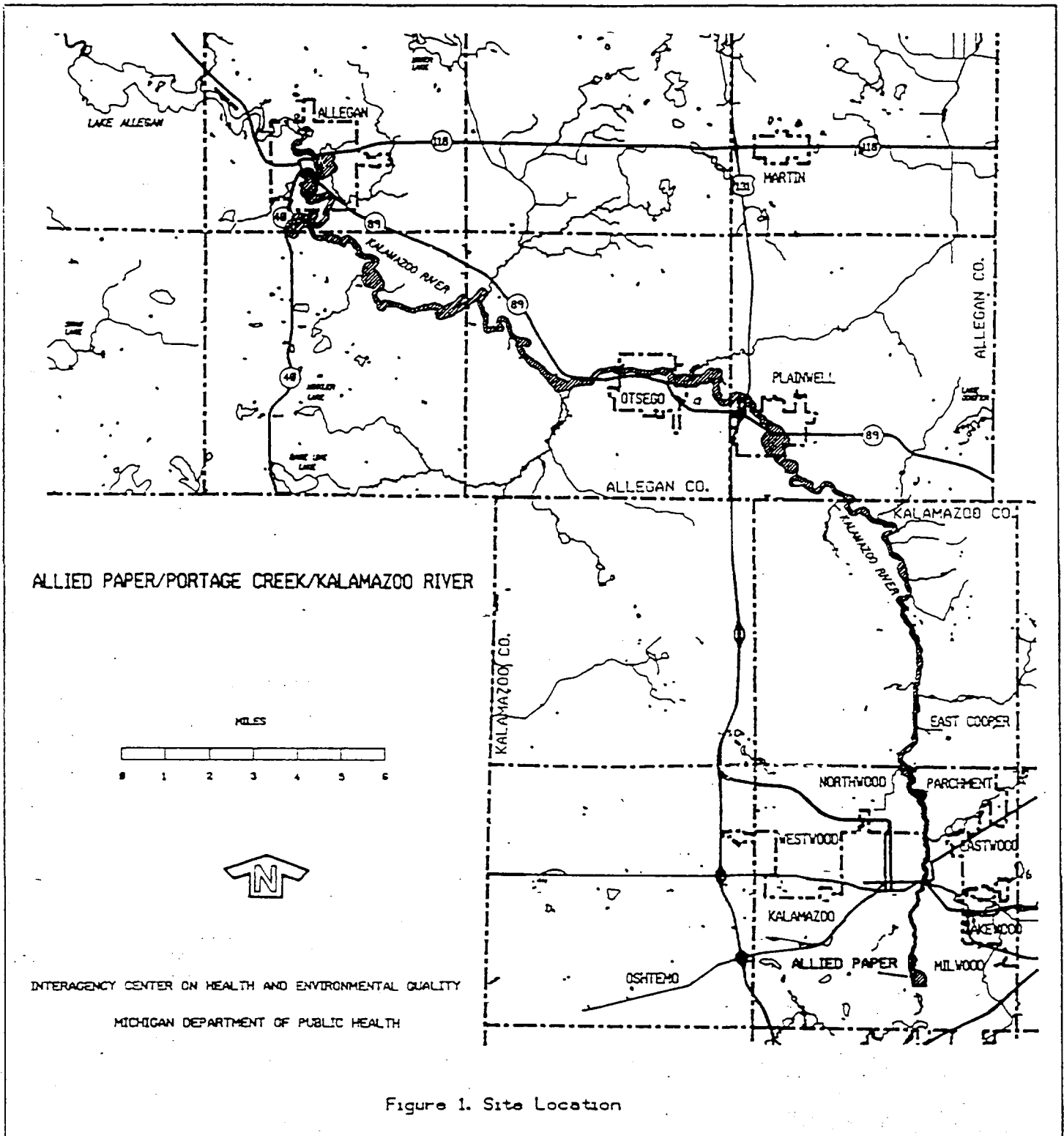


FIGURE 2.
ALLIED PAPER, INC. SITE

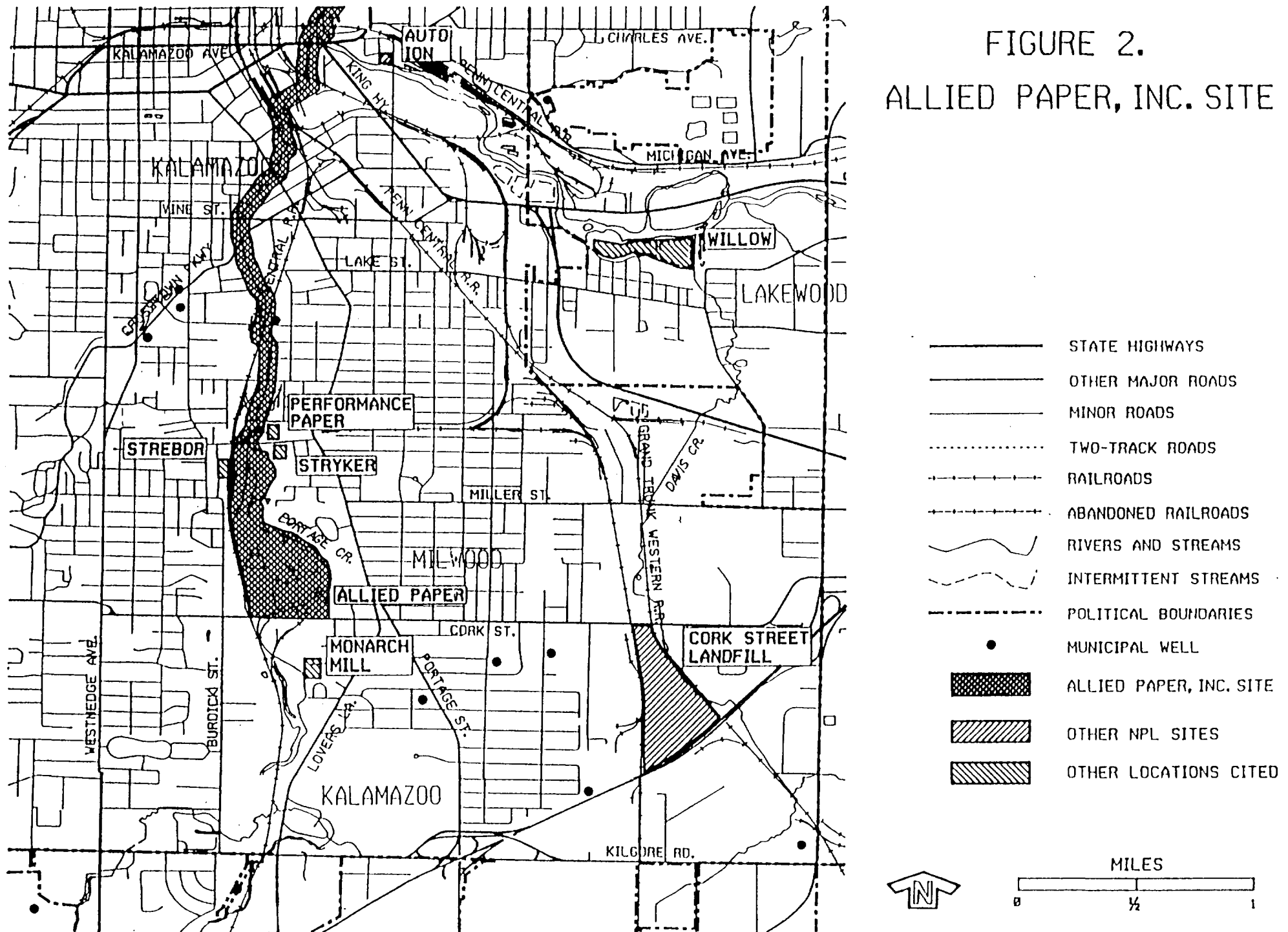


FIGURE 3.
ALLIED PAPER, INC.
RESIDUAL DISPOSAL AREA

